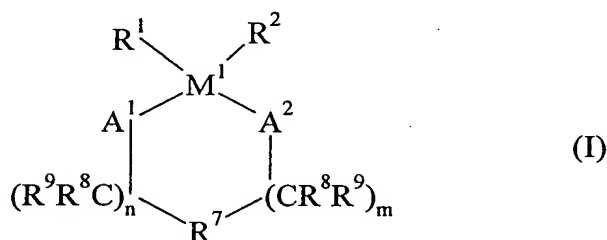


0122-PA

What is claimed is:

CLAIMS

1. A substantially amorphous poly(α -olefin) possessing a M_w of from about 500 to about 50,000, a M_w/M_n of from about 1.0 to about 10, a Kv_{100} of from about 10 to about 10,000, an iodine number of from about 0.0 to about 10, and a T_g of below about -60°C , obtained from the polymerization of at least one α -olefin having from 2 to about 20 carbon atoms and prepared by a process comprising polymerizing the monomer in the presence of hydrogen and a catalytically effective amount of a catalyst, wherein the catalyst comprises the product obtained by combining a metallocene catalyst with a cocatalyst, the metallocene catalyst being at least one *meso* compound of general formula:



wherein:

A^1 and A^2 are independently selected from the group consisting of mononuclear and polynuclear hydrocarbons;

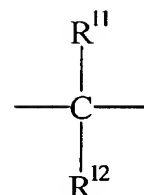
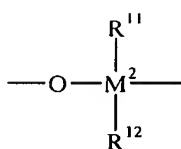
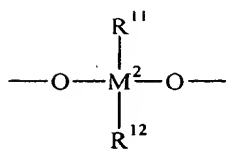
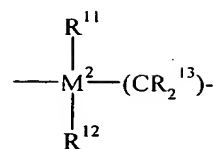
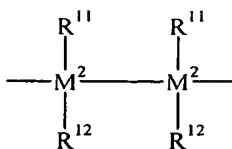
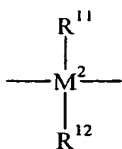
M^1 is a metal from group IVb, Vb, or VIb of the Periodic Table;

R^1 and R^2 are independently selected from the group consisting of hydrogen, C_1 - C_{10} alkyl, C_1 - C_{10} -alkoxy, C_6 - C_{10} aryl, C_6 - C_{10} aryloxy, C_2 - C_{10} alkenyl, C_7 - C_{40} arylalkyl, C_7 - C_{40} alkylaryl, C_8 - C_{40} arylalkenyl and halogen;

R^7 is selected from the group consisting of:

0122-PA

R⁷ is selected from the group consisting of:



=BR¹¹, =AlR¹¹, -Ge-, -Sn-, -O-, -S-, =SO, =SO₂, =NR¹¹, =CO, =PR¹¹ and =P(O)R¹¹, where R¹¹, R¹², and R¹³ are independently selected from the group consisting of hydrogen, halogen, C₁-C₁₀ alkyl, C₁-C₁₀ fluoroalkyl, C₆-C₁₀ aryl, C₆-C₁₀ fluoroaryl, C₁-C₁₀ alkoxy, C₂-C₁₀ alkenyl, C₇-C₄₀ arylalkyl, C₈-C₄₀ arylalkenyl, and C₇-C₄₀ alkylaryl, or, alternatively, R¹¹ can be combined with R¹² or R¹¹ can be combined with R¹³, in each case with the atoms connecting them, to form a ring; and M² is selected from the group consisting of silicon, germanium, and tin;

R⁸ and R⁹ are independently selected from the group consisting of hydrogen, halogen, C₁-C₁₀ alkyl, C₁-C₁₀ fluoroalkyl, C₆-C₁₀ aryl, C₆-C₁₀ fluoroaryl, C₁-C₁₀ alkoxy, C₂-C₁₀ alkenyl, C₇-C₄₀ arylalkyl, C₈-C₄₀ arylalkenyl, and C₇-C₄₀ alkylaryl;

m and n are identical or different and are zero, 1, or 2, with m plus n being zero, 1 or 2.

0122-PA

2. The poly(α -olefin) of Claim 1 wherein the cocatalyst is an aluminoxane.

3. The poly(α -olefin) of Claim 2 wherein the metallocene catalyst is combined with hydrogen and the aluminoxane cocatalyst in any order thereof in the presence or absence of monomer.

4. The poly(α -olefin) of claim 1 wherein the α -olefin is 1-decene.

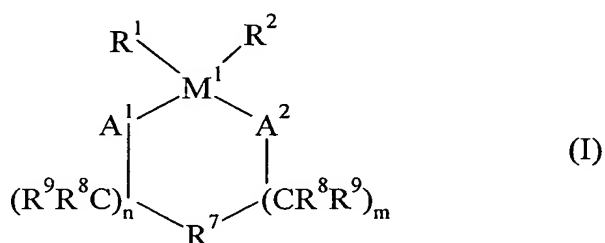
5. The poly(α -olefin) of claim 1 wherein the metallocene catalyst based in terms of the transition metal M^I, is present in an amount from 0.0001 to about 0.02 millimole/liter and the cocatalyst is present in an amount from 0.01 to about 100 millimoles/liter.

6. The poly(α -olefin) of claim 1 wherein the catalyst is selected from the group consisting of *meso*-Me₂Si(2-Et-Ind)₂ZrCl₂, *meso*-Et(Ind)₂ZrCl₂, *meso*-Et(IndH₄)₂ZrCl₂, *meso*-Me₂Si(Ind)₂ZrCl₂, *meso*-Me₂Si(IndH₄)₂ZrCl₂, *meso*-Me₂Si(2-Me-Ind)₂ZrCl₂, and *meso*-Me₂Si(2-Me-4-Ph-Ind)₂ZrCl₂.

7. A lubricant composition comprising a lubricant and a viscosity-modifying amount of a poly(α -olefin) wherein said poly(α -olefin) is substantially amorphous and possesses a M_w of from about 500 to about 50,000, a M_w/M_n of from about 1.0 to about 10, a K_{v100} of from about 10 to about 10,000, an iodine number of from about 0.0 to about 10, and a T_g of below about -60°C, and said poly(α -olefin) is obtained from the polymerization of at least one α -olefin having from 2 to about 20 carbon atoms and prepared by a process

0122-PA

comprising polymerizing the monomer in the presence of hydrogen and a catalytically effective amount of a catalyst, wherein the catalyst comprises the product obtained by combining a metallocene catalyst with a cocatalyst, the metallocene catalyst being at least one *meso* compound of general formula:



wherein:

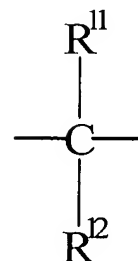
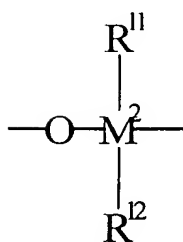
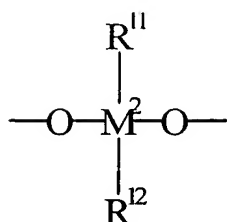
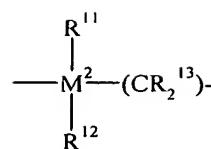
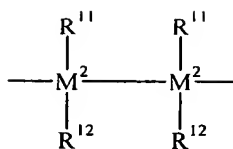
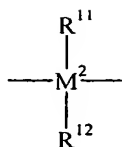
A¹ and A² are independently selected from the group consisting of mononuclear and polynuclear hydrocarbons;

M¹ is a metal from group IVb, Vb, or VIb of the Periodic Table;

R¹ and R² are independently selected from the group consisting of hydrogen, C₁-C₁₀ alkyl, C₁-C₁₀ -alkoxy, C₆-C₁₀ aryl, C₆-C₁₀ aryloxy, C₂-C₁₀ alkenyl, C₇-C₄₀ arylalkyl, C₇-C₄₀ alkylaryl, C₈-C₄₀ arylalkenyl and halogen;

R⁷ is selected from the group consisting of:

0122-PA



$=BR^{11}$, $=AlR^{11}$, $-Ge-$, $-Sn-$, $-O-$, $-S-$, $=SO$, $=SO_2$, $=NR^{11}$, $=CO$, $=PR^{11}$ and $=P(O)R^{11}$,

where

R^{11} , R^{12} , and R^{13} are independently selected from the group consisting of hydrogen, halogen, C_1 - C_{10} alkyl, C_1 - C_{10} fluoroalkyl, C_6 - C_{10} aryl, C_6 - C_{10} fluoroaryl, C_1 - C_{10} alkoxy, C_2 - C_{10} alkenyl, C_7 - C_{40} arylalkyl, C_8 - C_{40} arylalkenyl, and C_7 - C_{40} alkylaryl, or, alternatively, R^{11} can be combined with R^{12} or R^{11} can be combined with R^{13} , in each case with the atoms connecting them, to form a ring; and M^2 is selected from the group consisting of silicon, germanium, and tin;

R^8 and R^9 are independently selected from the group consisting of hydrogen, halogen, C_1 - C_{10} alkyl, C_1 - C_{10} fluoroalkyl, C_6 - C_{10} aryl, C_6 - C_{10} fluoroaryl, C_1 - C_{10} alkoxy, C_2 - C_{10} alkenyl, C_7 - C_{40} arylalkyl, C_8 - C_{40} arylalkenyl, and C_7 - C_{40} alkylaryl;

0122-PA

m and n are identical or different and are zero, 1, or 2, with m plus n being zero, 1 or 2.

8. The lubricant composition of claim 7 wherein the α -olefin is 1-decene.

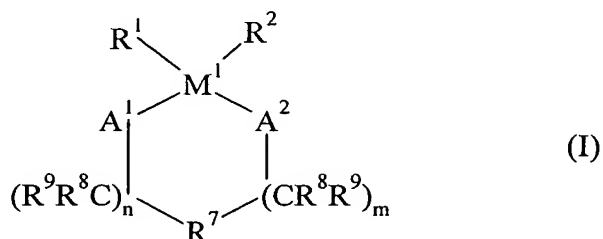
9. The lubricant composition of claim 7 wherein the metallocene catalyst based in terms of the transition metal M^I, is present in an amount from 0.0001 to about 0.02 millimole/liter and the cocatalyst is present in an amount from 0.01 to about 100 millimoles/liter.

10. The lubricant composition of claim 7 wherein the catalyst is selected from the group consisting of *meso*-Me₂Si(2-Et-Ind)₂ZrCl₂, *meso*-Et(Ind)₂ZrCl₂, *meso*-Et(IndH₄)₂ZrCl₂, *meso*-Me₂Si(Ind)₂ZrCl₂, *meso*-Me₂Si(IndH₄)₂ZrCl₂, *meso*-Me₂Si(2-Me-Ind)₂ZrCl₂, and *meso*-Me₂Si(2-Me-4-Ph-Ind)₂ZrCl₂.

11. A method for improving the viscosity index of a lubricant composition comprising adding to the composition a viscosity-modifying amount of a poly(α -olefin) possessing a M_w of from about 500 to about 50,000, a M_w/M_n of from about 1.0 to about 10, a K_v₁₀₀ of from about 10 to about 10,000, an iodine number of from about 0.0 to about 10, and a T_g of below about -60°C, wherein said poly(α -olefin) is substantially amorphous and is obtained from the polymerization of at least one α -olefin having from 2 to about 20 carbon atoms and prepared by a process comprising polymerizing the monomer in the presence of hydrogen and a catalytically effective amount of a catalyst, wherein the

0122-PA

catalyst comprises the product obtained by combining a metallocene catalyst with a cocatalyst, the metallocene catalyst being at least one *meso* compound of general formula:



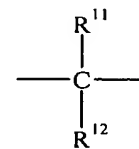
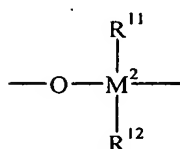
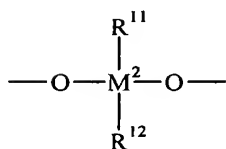
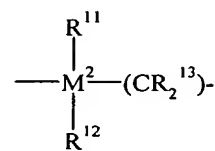
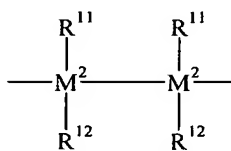
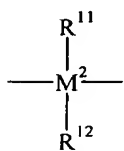
wherein:

A¹ and A² are independently selected from the group consisting of mononuclear and polynuclear hydrocarbons;

M¹ is a metal from group IVb, Vb, or VIb of the Periodic Table;

R¹ and R² are independently selected from the group consisting of hydrogen, C₁-C₁₀ alkyl, C₁-C₁₀ -alkoxy, C₆-C₁₀ aryl, C₆-C₁₀ aryloxy, C₂-C₁₀ alkenyl, C₇-C₄₀ arylalkyl, C₇-C₄₀ alkylaryl, C₈-C₄₀ arylalkenyl and halogen;

R⁷ is selected from the group consisting of:



=BR¹¹, =AIR¹¹, -Ge-, -Sn-, -O-, -S-, =SO, =SO₂, =NR¹¹, =CO, =PR¹¹ and =P(O)R¹¹,

0122-PA

where

R^{11} , R^{12} , and R^{13} are independently selected from the group consisting of hydrogen, halogen, C_1 - C_{10} alkyl, C_1 - C_{10} fluoroalkyl, C_6 - C_{10} aryl, C_6 - C_{10} fluoroaryl, C_1 - C_{10} alkoxy, C_2 - C_{10} alkenyl, C_7 - C_{40} arylalkyl, C_8 - C_{40} arylalkenyl, and C_7 - C_{40} alkylaryl, or, alternatively, R^{11} can be combined with R^{12} or R^{11} can be combined with R^{13} , in each case with the atoms connecting them, to form a ring; and M^2 is selected from the group consisting of silicon, germanium, and tin;

R^8 and R^9 are independently selected from the group consisting of hydrogen, halogen, C_1 - C_{10} alkyl, C_1 - C_{10} fluoroalkyl, C_6 - C_{10} aryl, C_6 - C_{10} fluoroaryl, C_1 - C_{10} alkoxy, C_2 - C_{10} alkenyl, C_7 - C_{40} arylalkyl, C_8 - C_{40} arylalkenyl, and C_7 - C_{40} alkylaryl;

m and n are identical or different and are zero, 1, or 2, with m plus n being zero, 1 or 2.

12. The method of claim 11 wherein the α -olefin is 1-decene.

13. The method of claim 11 wherein the metallocene catalyst based in terms of the transition metal M^1 , is present in an amount from 0.0001 to about 0.02 millimole/liter and the cocatalyst is present in an amount from 0.01 to about 100 millimoles/liter.

14. The process of claim 11 wherein the catalyst is selected from the group consisting of *meso*- $Me_2Si(2-Et-Ind)_2ZrCl_2$, *meso*- $Et(Ind)_2ZrCl_2$, *meso*- $Et(IndH_4)_2ZrCl_2$, *meso*- $Me_2Si(Ind)_2ZrCl_2$, *meso*- $Me_2Si(IndH_4)_2ZrCl_2$, *meso*- $Me_2Si(2-Me-Ind)_2ZrCl_2$, and *meso*- $Me_2Si(2-Me-4-Ph-Ind)_2ZrCl_2$.